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First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 Engineering Chemistry

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Derive Nernst equation for single electrode potential. (05 Marks)
b. Define electrolyte concentration cell. The e.m.f of cell $\text{Ag}|\text{AgNO}_3 (0.001\text{M})|| \text{AgNO}_3(\text{XM})|\text{Ag}$ is 0.0591 V at 25°C. Find the value of X. (05 Marks)
c. Explain the following battery characteristics: (06 Marks)
i) Cell potential
ii) Capacity
iii) Cycle life.

OR

- 2 a. Define reference electrode. Discuss the construction and working of Ag-AgCl electrode. (05 Marks)
b. Describe the construction and working of Lithium – ion battery. Mention its application. (05 Marks)
c. Describe construction, working and application of methanol O_2 fuel cell using H_2SO_4 as electrolyte. (06 Marks)

Module-2

- 3 a. Explain electrochemical theory of corrosion taking Iron as an example. (05 Marks)
b. Explain the following factors affecting corrosion (05 Marks)
i) Nature of corrosion product
ii) Ratio of Anodic to cathodic Area
iii) p^{H} of the medium.
c. Describe electroplating of chromium (decorative and Hard). Mention the reasons for not using chromium Anode in electroplating of chromium. (06 Marks)

OR

- 4 a. Explain waterline and pitting corrosion. (06 Marks)
b. What is metal finishing? Mention technological importance of metal finishing. (05 Marks)
c. Describe electro-less plating of copper with plating reactions. (05 Marks)

Module-3

- 5 a. Define Cracking. Explain fluidized bed catalytic cracking method with a neat diagram. (05 Marks)
b. What is Reforming of petroleum? Give any three reactions involved in reforming. (05 Marks)
c. What is photovoltaic cell? Explain the construction and working of photovoltaic cell. Mention any two advantages. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Calculate the Gross or Net calorific value of a coal sample from the following data obtained from Bomb calorimetric experiment. (05 Marks)
- | | | |
|--------------------------------------|---|----------------------------------|
| i) Weight of coal | = | $0.65 \times 10^{-3} \text{kg}$ |
| ii) Weight water in calorimeter | = | 1200g |
| iii) Water equivalent of calorimeter | = | 400g |
| iv) Latent heat of steam | = | $587 \times 4.2 \text{kJ/kg}$ |
| v) Rise in temperature | = | 1.8°C |
| vi) Sp-heat of water | = | $4.187 \text{kJ/kg} \%$ of H = 5 |
- b. Explain the modules, panels and arrays of the design of PV cell. (06 Marks)
- c. Explain the purification of silicon by zone refining process. (05 Marks)

Module-4

- 7 a. Explain free radical mechanism for addition polymerization taking vinyl chloride as an example. (06 Marks)
- b. Describe the synthesis and applications of the following polymer.
- | | |
|----------------------|------------|
| i) Plexiglass (PMMA) | (06 Marks) |
| ii) Polyurethane | |
- c. What is glass transition temperature? Discuss how flexibility of polymer chain affects glass transition temperature. (04 Marks)

OR

- 8 a. Calculate number average and weight average of a polymer in which 200 molecules of 1000 g/mole, 300 molecules of 2000g/mole and 500 molecules of 3000 g/mole are present respectively. (06 Marks)
- b. Explain the synthesis, properties and application of silicon rubber. (05 Marks)
- c. What is polymer composite? Describe the synthesis an application of Kevlar fibre. (05 Marks)

Module-5

- 9 a. Explain Scale and Sludge formation in the boiler. (05 Marks)
- b. Explain determination of DO (Dissolved O₂) by Winkler's method. (06 Marks)
- c. Write a note on fullerene. (05 Marks)

OR

- 10 a. Explain desalination of sea water by ion selective electro dialysis method. (05 Marks)
- b. Explain the synthesis of nanomaterial by chemical vapour condensation method. Mention advantages of this method. (05 Marks)
- c. Write short notes on Carbon nanotubes and Dendrimers. (06 Marks)

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